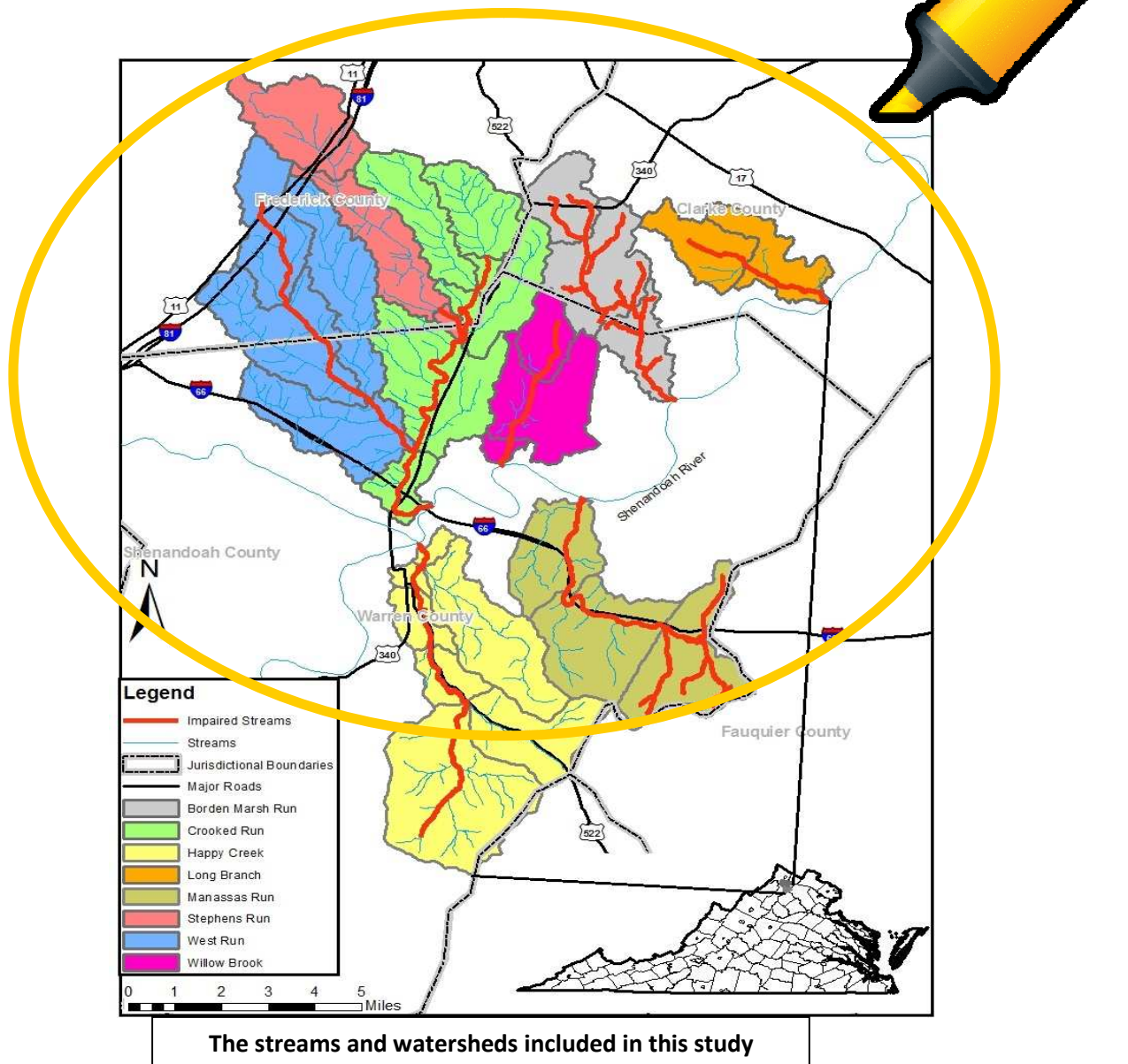


HIGHLIGHTING LOCAL STREAMS:

**Water Quality Studies on Tributaries of the Shenandoah River:
West Run, Stephens Run, Crooked Run, Willow Brook,
Borden Marsh Run, Long Branch, Happy Creek,
Manassas Run**



The Virginia Department of Environmental Quality (VADEQ) monitors the Commonwealth's streams and rivers (there are **52,232 miles** of them!) for five uses: fishing, swimming, wildlife, aquatic life (benthic), and drinking. When streams fail to meet standards based on these uses, they are declared to be "impaired", or not fully supportive of their beneficial uses,

*Are we being singled out?
No. In Virginia, 71% of
assessed streams are
considered "impaired".*

and placed on Virginia's impaired waters list. VADEQ reports this list to the USEPA every other year as required by the federal [Clean Water Act](#) of 1972. Based on routine water quality monitoring, several streams in Frederick, Clarke, and Warren Counties have been added to the list of waterways in Virginia that do not meet water quality standards. [West Run, Stephens Run, Crooked Run, Willow Brook, Borden Marsh Run, Long Branch, Happy Creek](#) and [Manassas Run](#) were all listed as impaired due to violations of the "primary contact" (or swimming) water quality standard, which takes into account the concentration of bacteria in the stream. VADEQ monitoring showed that there was enough bacteria to exceed the water quality standard over 10.5% of the time, thereby raising the risk of contracting gastro-intestinal illnesses. In addition, [Happy Creek](#) is considered impaired for aquatic life because it does not host a rich and diverse aquatic population. A **Total Maximum Daily Load** study must be prepared for streams that do not meet water quality standards and are listed as impaired.

TOTAL MAXIMUM DAILY LOAD

A **TMDL** is a pollution budget for a stream, which determines a maximum amount of a pollutant that can be released into a stream while still allowing the stream to maintain water quality standards. It is also the process of improvement that Virginia uses to make streams healthier and cleaner. This report is part of the TMDL studies for these streams.

Where is the bacteria coming from? There are many sources of bacteria within the watersheds. A computer model was able to estimate the diverse and various sources including: direct deposits from cattle into the stream as well as on land, point sources, pet and residential contributions, and wildlife contributions.

WHAT IS A WATERSHED?
It's an area of land that drains to a common point or body of water.



What is the general aquatic life water quality standard? What does benthic mean?

The basis of a stream's food chain is found in the community of the aquatic organisms that live at the bottom of the stream, known as benthic (or bottom-dwelling) macroinvertebrates (organisms without backbones that can be seen with the naked eye). These bugs are important because they are a key food source for other organisms. They play an important role in the

cycling of nutrients and are good indicators of pollutants. The aquatic life water quality standard states that all state waters should support a healthy and diverse community of invertebrates and fish. Based on VADEQ's biological monitoring results, it was concluded that **Happy Creek** was not meeting the standard. Here are a few examples of benthic macroinvertebrates (all images courtesy of Bob Hendricks).



From Left to Right: Dragonfly larvae, Stonefly nymph, caddisfly larvae, flathead mayfly larvae.

Why don't these streams support a healthy aquatic community? After reviewing various types of data and examining possible stressors in the aquatic habitat, VADEQ and the **Technical Advisory Committee**, made up of landowners and community members, identified the primary stressor on the aquatic community to be **sediment**. **Sediment** is soil that has been washed off the land during rain storms and soil that is scoured from the stream banks by fast moving water.

What is being done? VADEQ and its local partners on the **Technical Advisory Committee** have been working together to determine sources of the bacteria, suggest reductions, and recommend next steps in the process known as the **Total Maximum Daily Load (TMDL)** process. In the studies for these streams, a watershed-based approach was used to relate both land-based and in-stream sources of bacteria and sediment to water quality problems. In order to develop a **TMDL**, background pollutant concentrations, point source contributions, and non-point source contributions are considered. Through the **TMDL** process, states are able to identify water-quality based controls to reduce pollution and meet water quality standards.

How do we get the streams back to a safe and healthy condition? To better understand how the watersheds and streams worked together, the **Technical Advisory Committee** reviewed water quality data, land use information, population numbers and many other important pieces of information. Understanding these pieces of the puzzle as a **team** was crucial to appreciating the sources of bacteria in these watersheds and then recommending reductions from these sources. The reductions in the table below are a summary of what is necessary to bring these streams back to a safe and healthy condition.

Percent Reductions in Bacteria Needed To Bring the Streams Back To a Safe Condition

Stream Name	Livestock DD*	Pasture	Cropland	Developed areas**	Str. pipes and failing septic systems***
West Run	78%	43%	10%	0%	100%
Stephens Run	20%	34%	10%	5%	100%
Crooked Run	45%	40%	10%	5%	100%
Willow Brook	80%	35%	10%	0%	100%
Borden Marsh Run	87%	50%	15%	15%	100%
Long Branch	80%	77%	10%	0%	100%
Happy Creek	38%	15%	5%	15%	100%
Manassas Run	44%	30%	5%	0%	100%

* Livestock Direct Deposits of bacteria-laden manure into streams.

** Developed, or residential areas, often have large populations of household pets which can contribute bacteria to local waterways through waste left on the ground.

*** Straight pipes (pipes that carry raw sewage directly from toilets to streams) are illegal according to Virginia state law. Failing septic systems can be fixed and updated in order to maintain proper functions.

For **Happy Creek**, about **30%** of sediment in the watershed needs to be reduced in order to return the stream back to a healthy condition. If the following sources are reduced, sediment will be reduced and it is hoped that the aquatic community will again be a rich and diverse foundation for the food chain in Happy Creek.

30% reduction...From where?

- Crop and Haylands
- Harvested forest
- Developed Lands
- In-stream erosion

What's next? The goal of the **TMDL** program is to establish a path to **cleaner, healthier waters**. The first step in the process is to develop a water quality study that identifies the sources of pollution and recommends reductions that will result in these streams meeting water quality standards again. This handout is the summary of that work. The next step is to complete an Implementation Plan that will detail the actions, practices and strategies that are needed to achieve these pollutant reductions. The knowledge, insight, and assistance of local landowners is critical to this stage of the process to better understand what best management practices and techniques will work best in this area. The final stage in the **TMDL** process is implementation which is conducted on a voluntary basis, using incentives and outreach to encourage landowner participation.

Want more information? Want to make a difference to your local stream? Contact **Lord Fairfax Soil and Water Conservation District** and the **USDA Natural Resources Conservation Service** for more information on available cost-share programs at 722A E. Queen St. Strasburg, VA 22657 or (540)868-1130 or www.lfswcd.org/. Find out more about the **Friends of the Shenandoah River** at www.fosr.org.